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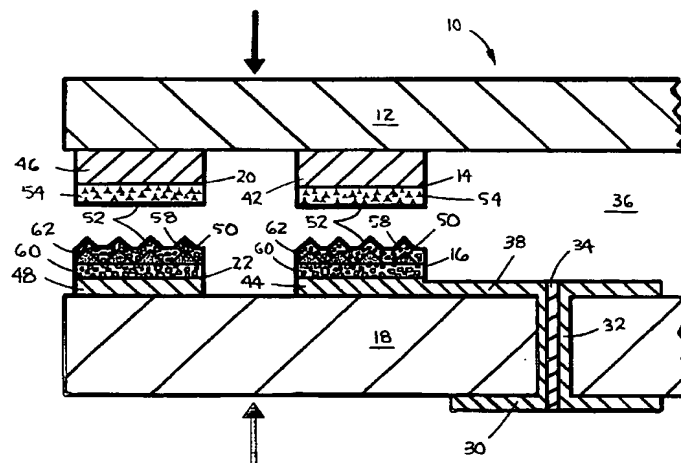
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(54) Title: FLUXLESS ASSEMBLY OF CHIP SIZE SEMICONDUCTOR PACKAGES



(57) Abstract: A method for assembling semiconductor packages (10) includes forming corresponding pairs of conductive pads (14, 16, 20, 22) on respective surfaces of a die (12) and an interconnect substrate (18). Each pad in each pair includes an upper portion comprising at least one component of an electrically conductive eutectic alloy. Sharp, upstanding peaks (50, 58) are formed on at least one of the pads in each pair. The die and substrate are forcefully abutted and the pads heated until the sharp peaks penetrate through oxide films (52) on the respective opposing pads in each pair and contact the upper surface of the other pad therein, thereby initiating pad fusion. The pads are then cooled to solidify the molten portions thereof into an electrically conductive joint between each corresponding pair of pads and a hermetic seal around the periphery of the package.



**(15) Information about Correction:**

see PCT Gazette No. 51/2003 of 18 December 2003, Section II

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/06188

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01L 21/44, 23/48

US CL : 438/614; 257/739

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 438/614; 257/739

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST

search terms: (peak or spike or dendritic) with (contact or pad or pin or ball)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,900,674 A (WOJNAROWSKI et al.) 04 May 1999 (04.05.1999), Figs. 13, 14a, 16; and cols. 7-8.	1-4, 11-13, and 15
Y	US 5,938,454 A (BRODSKY et al.) 17 August 1999 (17.08.1999), Figs. 1, 5; and cols. 3-4.	1-3, 5-6 and 11-16
Y,E	US 6,399,896 B1 (DOWNES, Jr. et al.) 04 June 2002 (04.06.2002), Fig. 3; cols. 6-7.	1-2, 4, 14, and 16
Y	US 4,404,453 A (GOTMAN) 13 September 1983 (13.09.1983), Fig. 2; col. 4.	7

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

Special categories of cited documents:		"I"	Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

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